A8640-2 U 3/85

North
American
Telecommunications
Association

1985 TELECOMMUNICATIONS

SOURCE BOOK

The North American Telecommunications Association

1985 Telecommunications Sourcebook

The *1985 NATA Telecommunications Sourcebook* provides a users/buyers' guide to the telecommunications industry.

Besides offering industry members a comprehensive, ready reference to specific telecommunications products, contractors, telecommunications industry services, and resources, the *Sourcebook* serves as an invaluable reference for a wide range of additional industry observers:

- Financial/investment planners who rely on NATA's Annual *Statistical Review*.
- Telecommunications managers and consultants who must keep abreast of emerging technologies, services, and cost management systems.
- Telecommunications users considering the purchase of new voice or data systems or upgrades to existing systems.
- Telecommunications information specialists and librarians needing a comprehensive reference for market trends and names of corporations engaged in telecommunications research and manufacturing.
- Faculty and students of the numerous university telecommunications programs wishing to identify industry leaders, understand the impact on the industry of key judicial, regulatory, and legislative initiatives, and learn of all available industry resources.

The *Telecommunications Sourcebook* is published annually by the North American Telecommunications Association, 2000 M Street, N.W., Suite 550, Washington, D.C. 20036. Telephone: (202) 296-9800.

Copyright 1984 by the North American Telecommunications Association.

Editorial Staff:
Mary Bradshaw
Mollie McOwen
David Keeler
Paul Freeman
Editorial/Production Assistant:
Virginia Cizik

North American Telecommunications Association

1985 Telecommunications Sourcebook

TABLE OF CONTENTS

Trends: The Competitive Telecommunications Industry

Foreword 7

Industry Overview ..... Edwin B. Spievack 9

Public Policy

Domestic

Policy Year in Review ..... Adam Kernan-Schloss 11

International

International Trade and Trends in Telecommunication Equipment ..... Lloyd S. Kaufman 17

International Trade: Problems and Prospects for the Telecommunications Industry ..... Arthur A. Bushkin 19

Buying

Executive Workstations: Productivity Tools for Senior Managers ..... Dr. John M. McQuillan 21

Selecting New Telephone Service: Decisions, Decisions ..... John E. Madrid 24

Call Accounting Systems: The User's Solution ..... Daniel I. Stusser 29

The Changing Role of the Corporate Telecommunications Manager ..... James Sobczak 31

Marketing

AT&T Update: CPE Market Strategies ..... James K. Blake 33

Telecommunications and the Intelligent Building ..... William S. Herald 36

Personal Computers: Implications for the Competitive Equipment Market ..... Marc H. Rudov 40

Interconnects and OCCs—New Partners in New Business Opportunities ..... Walter W. Pioli 42

Mining Your Installed Base: Sales of Peripherals ..... Don M. Estes 44

Managing Inventory in the Deregulated Environment ..... William R. Cobb 46

Telemarketing: An Effective Tool for Communications Equipment Suppliers ..... John Kotopka 49

It's Time to Think "Leasing" ..... Roy F. Lee 51

Technology

The Future of Voice Telephone Services ..... Richard A. Kuehn 53

The Status of Voice/Data Integration ..... Janet Cohen 55

Cellular: Telephone Service On-The-Go ..... Alan A. Reiter 57

Statistical Review

Foreword 61

Industry Outlook 63

Key Market 67

PBX-Centrex Market 73

Interconnect and Retail Markets 80

U.S. Balance of Trade: 1983 84

Glossary 86

List of Tables

Stand-Alone Key Market Installed Base: 1979-1988 68

1983 Key System Installed Base 70

Key Manufacturers' Shipments: 1979-1988 72

PBX-Centrex Market Installed Base: 1979-1988 74

PBX Manufacturers' Shipments: 1979-1988 77

Bell PBX-Centrex Instrument Movement by State: 1983 79

Interconnect Industry Projected Sales & Revenues: 1982-1988 81

Retail Sales of Telephone Equipment: 1984 & 1985 82
Subscriber Access Lines by Type of Service: 1983 83
U.S. Balance of Trade in Telephone and Telephone Switching Equipment: 1983 84

List of Charts

Stand-Alone Key Market Installed Base by Vendor: 1980, 1983, 1986 67
Stand-Alone Key Market Installed Base: 1979-1988 70
Estimated Key Telephone Shipments: 1980-1986 71
PBX Installed Base by Vendor: 1980, 1983, 1986 73
PBX Installed Base: 1979-1988 76
PBX-Centrex Installed Base: 1979-1988 76
Estimated PBX Shipments: 1980-1986 78
Interconnect Industry Projected Sales & Revenues: 1982-1988 80
U.S. Imports and Exports of Telephone Equipment: 1983 85

Product Guide

Foreword 89
PBX Systems 91
Key Systems 102
Hybrid Systems 116
Components and Enhancements 121
Hardware 133
Glossary 142

Directory

Foreword 147
Contractors (Listed by State) 149
Sales, Installation, and Maintenance of PBX and Key Telephone Equipment
Manufacturers and Suppliers (Listed Alphabetically) 221
The Manufacture and Wholesale Supply of PBX and Key Telephone Equipment
Components and Enhancements Equipment (Listed Alphabetically) 251
The Manufacture and Sale of Related Telecommunications Equipment
Telecommunications Services (Listed Alphabetically) 265
Consulting, Training, Lease Financing, and Related Services

Resources

Foreword 275
Conventions 277
Publications 283
COG Centers (Listed by State) 297
State Associations 305

Indices

General (Alphabetical Listing of Firms Appearing in Directory Section) 317
Advertisers 332

NATA

Foreword 337
Profile 339
Fact Sheet 342
Board of Directors 343
Associate Members 344

Foreword

The *1984 Telecommunications Equipment Industry Statistical Review* is designed to provide a coherent and up-to-date picture of the business telephone equipment market in the United States. The findings contained here are based on the best available data and a set of assumptions derived from actual trends and developments as observed by a wide range of industry participants.

The *1984 Review* presents a completely fresh appraisal of trends and probable developments in the telecommunications equipment industry. While previous years' projections are used extensively in preparation of the data contained here, the rapid pace of developments in the legal, regulatory, and market areas over the past several years forces responsible analysts to keep an open mind and constantly reevaluate assumptions and projections in light of current conditions. NATA believes this *Review* contains the best possible set of data and projections available, but it must be recognized that market conditions are extremely turbulent right now, and the telecommunications equipment industry is still in the midst of a massive shake-up as a result of both the divestiture of AT&T and the FCC's deregulation of customer premises equipment. The picture that emerges of the market still is cloudy, with some reported trends seemingly at odds with each other, and the forecasts included here should be used with appropriate caution.

Major sources of NATA's study have been FCC and United States Telephone Association (USTA) statistics. In addition, NATA has conducted an informal survey of a wide range of industry participants in an effort to round out our picture of the interconnect side of the industry. Finally, NATA researchers reviewed a wide range of recent industry studies and consulted a number of independent analysts to ensure no significant aspects of the industry were overlooked. While these studies and independent experts were extremely helpful, the data and assumptions contained in this *Review* are entirely those of NATA.

David Keeler
Manager, Market Research
July 1984

Table of Contents

Page

Industry Outlook 63
Key Market 67
PBX-Centrex Market 73
Interconnect and Retail Markets 80
U.S. Balance of Trade: 1983 84
Glossary 86

List of Tables

Stand-Alone Key Market Installed Base: 1979-1988 68
1983 Key System Installed Base 70
Key Manufacturers' Shipments: 1979-1988 72
PBX-Centrex Market Installed Base: 1979-1988 74
PBX Manufacturers' Shipments: 1979-1988 77
Bell PBX-Centrex Instrument Movement by State: 1983 79
Interconnect Industry Projected Sales & Revenues: 1982-1988 81
Retail Sales of Telephone Equipment: 1984 & 1985 82
Subscriber Access Lines by Type of Service: 1983 83
U.S. Balance of Trade in Telephone and Telephone Switching Equipment: 1983 84

List of Charts

Stand-Alone Key Market Installed Base by Vendor: 1980, 1983, 1986 67
Stand-Alone Key Market Installed Base: 1979-1988 70
Estimated Key Telephone Shipments: 1980-1986 71
PBX Installed Base by Vendor: 1980, 1983, 1986 73
PBX Installed Base: 1979-1988 76
PBX-Centrex Installed Base: 1979-1988 76
Estimated PBX Shipments: 1980-1986 78
Interconnect Industry Projected Sales & Revenues: 1982-1988 80
U.S. Imports and Exports of Telephone Equipment: 1983 85

1984 Telecommunications Equipment Statistical Review

Industry Outlook

An Industry In Transition

The U.S. telecommunications industry in general, and the telecom equipment market in particular, are in the midst of a landmark transition. The current restructuring of the market, mandated by a series of inter-related legal and regulatory decisions over the past four years, surpasses both the market consolidation of the early 1900s and the reintroduction of competition in the 1960s and 1970s. And this legal/regulatory restructuring of the industry may have as great a long-term impact as the current technological revolution. At stake are not only the products and services that will be available to consumers in the future, but also the supply sources, the prices, and terms of sale. While competition undoubtedly will survive the present transition, it will almost certainly not keep its present form—a contest among a seemingly endless number of new independent vendors. To the contrary, market forces today seem to be bringing about a dramatic concentration of market players in a trend which has far-reaching implications for both the present entrepreneurial nature of the industry and for consumer choice.

Indeed, market shifts between the first and second quarters of 1984 require that the projections included in this year's *Statistical Review* be followed very cautiously. Each year these figures are based on a 16 month reporting period spanning the previous calendar year and the first four months of the year of publication. During that traditional timeframe, many interconnect dealers were still expressing a great deal of optimism based on market gains in the initial wake of divestiture. More recent contact with independent vendors, however, paints a less optimistic picture of trends which, if sustained, would significantly alter these earlier telecommunications market projections. Reports from the second quarter of 1984 indicate independent vendors confronted a more aggressively competitive response from the divested Bell Operating Companies (BOCs) as well as the near-impossibility of marketing against AT&T Information Systems' (ATT-IS) recently inherited embedded base products. ATT-IS has been offering embedded base customers extremely low prices on embedded equipment, together with threatened imposition of contract termination charges if the customer opts for non-AT&T equipment, even though the legality of such termination charges is in question.

Reinforcing this picture are unofficial reports from some of the BOCs themselves that while the first quarter of 1984 was a severe disappointment for them, second-quarter activity showed a sharp upward swing.

On top of this strong second-quarter showing for the BOCs was the surprisingly strong rebirth of Centrex in 1983. With the help of tariff reductions in the states, offerings in very low line-size configurations, and enhanced feature packages, the BOCs turned a loss of about 500,000 Centrex stations in 1982 into a gain of about 180,000 stations in 1983. Independent vendors, particularly in the upper Midwest and Great Lakes regions, report a resurgence of interconnect prospects opting for Centrex service over customer premises equipment (CPE). This development will have a severe impact on projected PBX growth rates, which were expected to benefit from continued customer change-outs of Centrex service: and in its lower line-size configurations Centrex will compete with some key system products as well.

Likely to compound effects of Centrex's second-quarter resurgence are two FCC decisions in July 1984 which appear to have strengthened significantly the marketing hands of both the BOCs and ATT-IS. First, the FCC voted to allow the BOCs' competitive equipment subsidiaries to market basic intrastate services, including Centrex offerings, in conjunction with their own hardware sales. While this decision mandates that independent (non-BOC) equipment vendors also be allowed to act as agents for the sale of local exchange services, the terms and conditions for this independent agent relationship are still unclear. Second, the FCC also lifted the *Computer Inquiry II* ban on the resale of long-distance telephone service by ATT-IS and ruled that the unregulated AT&T subsidiary could resell the basic interstate services of AT&T Communications as well as those of other domestic long-haul carriers. The FCC is currently considering an AT&T petition to remove all or most of the remaining *Computer Inquiry II* structural separation requirements and allow even closer sales and marketing links between the regulated and unregulated parts of the corporation. Thus, less than a year after the divestiture of the integrated Bell System, interconnect companies are once again faced with the prospect of competing against integrated service and equipment suppliers in the form of AT&T and the BOCs who may now mix regulated with unregulated product offerings.

Bell Operating Companies

The seven divested BOCs reentered the business telephone equipment market January 1, 1984. While they were stripped of most of their historical installed base, they did retain their embedded Centrex equipment and consequently a powerful position in the PBX market. The BOCs also retained the Bell name, bottleneck control over local transmission service, and tremendous financial strength, all of which provided a powerful base from which to launch a reentry into the equipment market.

Unofficial reports indicate the BOC's actual performance over the first half of 1984 has been mixed, with some showing almost immediate success, while others continue to be plagued by confusion and an inability to generate sales. Unfortunately, six months of start-up operations simply do not provide

enough of a record for an accurate appraisal of each of the individual companies, but some general trends do seem to have emerged. First, the BOCs have been tremendously successful in protecting Centrex as a viable product. Aided by the FCC's delay in imposing access charges on Centrex, by cut-rate charges for pre-July 27, 1983, Centrex users, and by the willingness of most states' regulatory agencies to grant rate reductions on the service, the BOCs have managed to stave off the flight from Centrex that was foreseen when the access-charge order was first released in 1983.

Second, as a result of divestiture, the BOCs are no longer captive outlets for AT&T's manufacturing arm. Rather, they have become major market outlets for general trade equipment. This fact has caused considerable concern among interconnect vendors for two reasons. First, interconnect vendors worry about delivery schedules. Manufacturers with large BOC contracts have, to some extent, allocated large shares of their product to the Bell companies at the expense of traditional interconnect outlets, causing widespread dislocations in product lines and distribution patterns among interconnect vendors. This has resulted in problems with both technical training, and support and marketing programs. In some cases, the lack of reliable delivery schedules has called into question the vendor's own ability to meet contractual obligations to end-users as cut-overs have necessarily been delayed and rescheduled for want of the switch from the factory.

The second problem, arising from the BOCs' reliance on general trade equipment, is the escalation of the already severe price competition in the market. Even before divestiture, interconnect vendors increasingly found themselves bidding against the same or nearly identical products. The entry of the BOCs as general trade equipment vendors intensified this problem. At the same time, the BOCs have been quite willing to engage in the already rampant price war, with many vendors reporting BOC prices ranging from 10 to 30 percent below anything they can offer. Obviously, with their tremendous financial resources, the BOCs will be able to sustain this price war far longer than most interconnect companies.

The FCC decision in July 1984 allowing the BOCs' unregulated subsidiaries to market basic transmission services, including Centrex, in conjunction with CPE will further strengthen the new companies' abilities to compete in the market. With integrated service and equipment offerings, the BOCs can provide potential customers with "one-stop shopping" for CPE and local exchange services, much as they did prior to divestiture. The prediction that at least one of the BOCs will drop out of the equipment market by 1987, put forward by a number of analysts in recent months, looks increasingly questionable in light of this decision. While that assumption has been incorporated into our projections, it will probably be 18 to 24 months before the long-term viability of the individual BOCs' equipment operations can accurately be assessed.

AT&T

AT&T Information Systems (ATT-IS) faces its own problems, which differ significantly from those confronting the BOCs. The massive personnel shake-up that preceded divestiture appears to have settled, although the recent announcement of a salary freeze for managers through 1985 indicates some problems may persist. ATT-IS also is faced with the task of developing an effective marketing program for a company which historically has shunned modern marketing approaches. This problem is currently compounded by its weakness in product offerings. Finally, the embedded base of Western Electric equipment, which ATT-IS inherited, imposes a huge administrative and support burden on the company.

Despite the more than considerable significance of these problems, ATT-IS is already moving to meet the challenges of the post-divestiture marketplace. The embedded base, after all, offers tremendous opportunities, not least of which is an immediate flow of revenue from lease agreements and service. The possession of the largest single base of equipment in the market (55 percent of the combined PBX and key installed base in 1983) also gives ATT-IS the opportunity to migrate existing customers to new product offerings, or, if the situation warrants, to sell the in-place equipment at a very low price to forestall competitive sales. The threatened imposition of contract termination charges on embedded base customers, even though the legality of such charges is in question, has provided ATT-IS with considerable leverage in these situations. While the ATT-IS product line is spotty right now, its development program appears to be on track, and by mid-1986, most of the holes will have been filled. Finally, AT&T has been moving aggressively to displace the old, regulated, order-taking mentality among its sales force and replace it with a more orthodox marketing approach. This task will be simplified by the FCC's vote to allow ATT-IS to act as a resale vendor for long-distance service.

The July 1984 FCC decision to allow ATT-IS to act as a reseller of long distance service in conjunction with its CPE sales operations, and the threatened additional easing of *Computer Inquiry II* restrictions, are expected to tremendously strengthen ATT-IS' marketing power. Allowed to resume its historical role as an integrated equipment and service supplier, AT&T may well emerge as a stronger contender than the present forecasts indicate, although it is impossible at this time to quantify what this strength may translate into in terms of equipment sales volumes and installed base retention. The impact this will have will depend largely on the ability of interconnect vendors to put together similar packages offering long distance services and/or act as agents for the sale of network services, and on whether the market perceives these as truly competitive with ATT-IS' integrated offerings.

The Interconnect Market

Nineteen eighty three represented a unique opportunity for interconnect companies, presenting independent vendors with pervasive consumer uncertainty over the fate of the Bell System, AT&T in the throes of a massive reorganization, and the BOCs constrained from marketing new equipment. Not surprisingly, interconnect vendors achieved record sales volumes and rev-

enues in 1983, though the extent of erosion in the BOC installed base, subsequently transferred to ATT-IS on January 1, 1984, was higher than expected. User confusion and uncertainty over the fate of the Bell System, together with the BOCs' inability to support some customer upgrade and expansion needs from their inventories, led to a massive flight from Bell. The BOCs reported a 7 percent loss on their combined PBX-Centrex equipment base, even though, as noted, Centrex CO lines increased, with a 12.7 percent decline in total business instruments, and a whopping 22.4 percent drop in residential telephones.

Despite the record performance for the industry as a whole, conditions were mixed for most individual firms. Lured by the seemingly endless opportunities provided by the AT&T divestiture, the number of new entrants into the interconnect market skyrocketed, flooding an already saturated market with new vendors. The predictable result of this deluge was the almost complete collapse of the pricing structure in the marketplace, as companies with virtually no track record on service and maintenance sought to buy a position in the market. This was especially true in the key telephone market, where the advent of skinny-wire electronic key systems has lowered the threshhold of technological expertise needed to enter the market. Therefore, while industry revenues reached an historic peak in 1983, there were many more companies chasing those revenues, with the result that firms showed even lower profit margins than in 1982.

The outlook for the interconnect industry over the next three years is not bright. The re-entry of AT&T and the BOCs will result in interconnect sales volume declines from its 1983 peak. With even more companies competing for those sales, the inevitable result will be further price erosion and an unhealthy profit picture. As the BOCs and ATT-IS reach their stride in 1985 and 1986, competition will reach an intense pitch, with market shares increasingly concentrated among vendors who are able to maintain profit margins.

Following this period, we predict, the market will settle down to more normal patterns, as companies consolidate their installed base positions and begin to recoup losses through marginal price hikes. The telecommunications equipment industry in the late 1980s will be considerably more concentrated than it is now, dominated by large companies offering an integrated range of products and services. In particular, resale of long distance service, together with the newly created opportunity to act as sales agents for local exchange services, may prove to be powerful marketing tools for interconnect vendors in the post-divestiture environment.

Summary of NATA Projections

The following summarizes NATA's projections for interconnect (non-ATT-IS/BOC) industry development over the next five years:

- Installed base growth of key station instruments will average 12.9 percent between 1984 and 1988, down from 39.3 percent average annual growth between 1979 and 1983.
- Market share of installed key telephone station instruments will rise to 28.8 percent in 1988, up from 19.2 percent in 1983.
- Installed base growth of PBX station instruments will average 7.1 percent between 1984 and 1988, down from 22.2 percent average annual growth between 1979 and 1988.
- Market share of installed PBX station instruments will increase to 43.3 percent in 1988, up from 39.2 percent in 1983.
- Annual revenues from primary sales to end-users will show a slight net decline between 1984 and 1988, as a result of general price erosion in the industry and an expected drop in volume following 1983's artificial peak. Growth in total revenues will show a small net increase.

The following summarizes NATA's projections for independent (non-AT&T) manufacturers' development in the next five years:

- Total growth in shipments of key telephone station instruments will average 4.7 percent through 1988, down from 5.1 percent between 1979 and 1983. In 1988, independent manufacturers will account for 64.3 percent of total shipments.
- Total growth in PBX shipments will average 4.1 percent through 1988, down from 7.5 percent between 1979 and 1983. In 1988 independent manufacturers will account for 71.2 percent of total shipments.

The New Bell System

When AT&T spun off its 23 wholly-owned Bell Operating Companies (BOCs) on January 1, 1984, the divested companies were regrouped under seven new regional corporations. Each of these new parent companies, often referred to as Regional Holding Companies (RHCs) or Regional Bell Operating Companies (RBOCs), controlled two or more of the old Bell Operating Companies. For continuity and simplicity, these seven regional companies are referred to as BOCs throughout this report.

Since their divestiture each of the BOCs has been marketing customer premises equipment (CPE) on an unregulated basis through a variety of subsidiary organizations. The chart below presents an outline of the new post-divestiture companies and their CPE subsidiaries. Following the FCC's decision in July of 1984, the BOCs' unregulated subsidiaries may also market basic transmission services, including Centrex, in conjunction with CPE.

Regional Holding Company	Holding Company Subsidiary Responsible for CPE Operations	Operating Companies and Their CPE Subsidiaries
NYNEX	• NYNEX Business Information Systems CPE direct sales & marketing	• New York Telephone • New England Telephone
Bell Atlantic	• Bell Atlanticom CPE direct sales & marketing	• New Jersey Bell • Bell of Pennsylvania • Diamond State Telephone • C&P Telephone of DC • C&P Telephone of VA • C&P Telephone of WV • C&P Telephone of MD
BellSouth	• BellSouth Advanced Systems Marketing & sales support to the direct sales outlets associated with the operating companies	• Southern Bell — Southern Bell Advanced Systems CPE direct sales & marketing • South Central Bell — South Central Bell Advanced Systems CPE direct sales & marketing
Southwestern Bell	• Southwestern Bell Telecommunications CPE direct sales & marketing	• Southwestern Bell
Ameritech	• Ameritech Communications Marketing & sales support to the direct sales outlets associated with the operating companies	• Illinois Bell • Indiana Bell • Michigan Bell • Ohio Bell • Wisconsin Telephone — CPE direct sales and marketing subsidiaries associated with each of the operating companies [names not yet available]
U S WEST	• FirsTel CPE direct sales & marketing • Interline Consulting & equipment brokerage	• Northwestern Bell — Northwestern Bell Information Technologies CPE direct sales & marketing • Mountain Bell — Mountain Bell Technologies CPE direct sales & marketing • Pacific Northwest Bell — COMM + Systems Data products sales
Pacific Telesis	• PacTel Communications Systems CPE direct sales & marketing	• Pacific Telephone • Nevada Bell

Key Market

Installed Base

Update

Projections for the stand-alone key system base have been revised to reflect a steep decline in the Bell System base in 1983 and a corresponding jump in the interconnect base. This revision is based on reported interconnect activity as well as year-end reports filed with the FCC by the BOCs.

The second major revision from last year's *Review* is a lower overall growth rate projected for the market, from an overly optimistic 5.6 percent annually projected last year to about 3.8 percent this year. The new growth rate better reflects actual manufacturer and vendor expectations, and also some of the expected impact from the success of Centrex offerings in very low line-size configurations.

Highlights

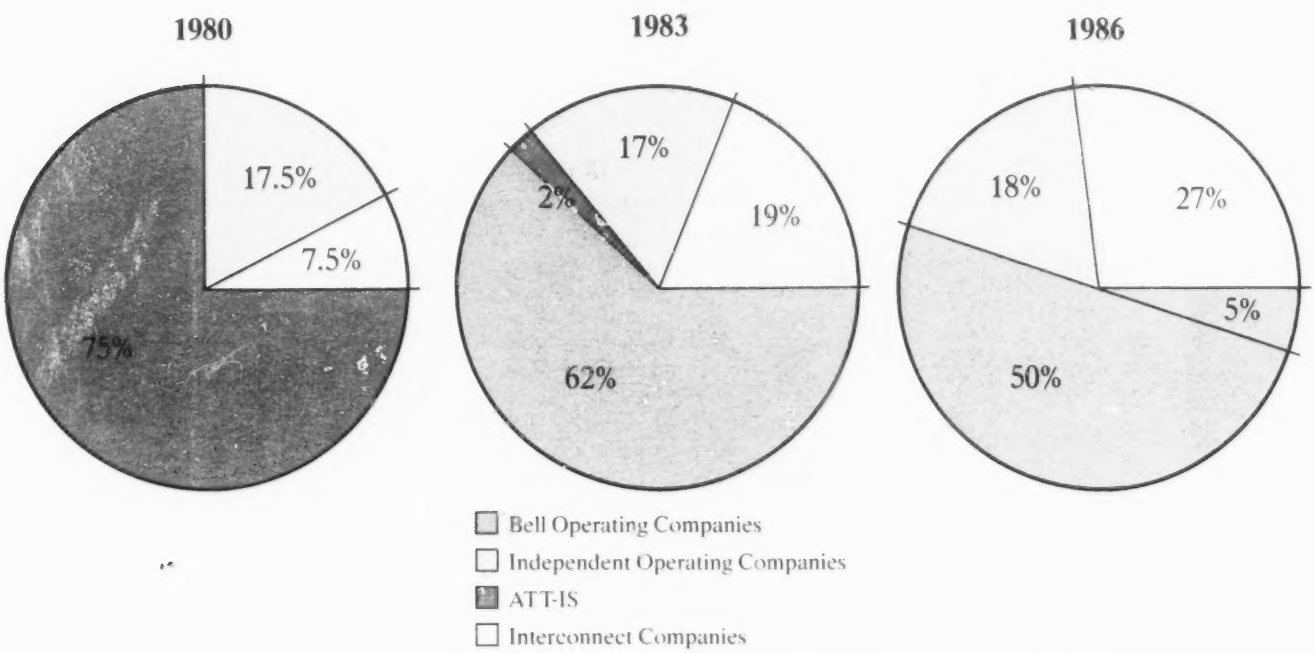
The overall installed base of stand-alone key sets grew by about 3 percent, or 550,000 instruments in 1983, slightly below the 3.8 percent average annual growth projected for 1984-88. The lower growth rate for 1983 can be attributed in part to confusion in the marketplace generated by the imminent AT&T divestiture, and in part to vendors' concentration on replacing the Bell System base. This heavy targeting of the installed base, both by ATT-IS and independent vendors, will continue for the next couple of years, but by 1986, vendors will have to begin cultivating new markets in order to keep volume up and protect profits.

The interconnect installed base grew by a phenomenal 62.8 percent in 1983, well above the 12.9 percent average annual increase forecast for 1984-88. This surge was the result of frustrated and nervous users abandoning their historic Bell System suppliers. Interconnect market share rose to 19.2 percent in 1983, and is expected to reach 28.8 percent by 1988.

Interconnect

Nineteen eighty three saw a sharp jump in interconnect sales and installed base of key systems, largely at the expense of the BOCs. The BOCs were in a uniquely constrained position in 1983, unable to offer CPE except equipment from existing stocks to established customers. This resulted in widespread instances where the operating companies' inability to provide spare parts and support for customers' expansion needs added to users' growing insecurity over divestiture and seriously eroded confidence in the Bell Companies' reliability as service and equipment vendors. While ATT-IS, still in its start-up mode, undoubtedly benefited to some extent from this situation, the real beneficiaries were the independent interconnect companies. (Ironically, interconnect key vendors also benefited from the resurgence of BOC Centrex service by providing station equipment for many of the new systems.) With the transfer of the Bell installed base to ATT-IS and the re-entry of the BOCs into the equipment market on January 1, 1984, 1983 represented, in many ways, a one-time shot at the Bell base in its most vulnerable state.

STAND-ALONE KEY MARKET INSTALLED BASE BY VENDOR



Stand-Alone Key Market: 1979 - 1983
Installed Base Development

Instruments (000)	1979	1980	1981	1982	1983
BELL OPERATING COMPANIES	11,961	12,430	12,636	12,773	11,500
Growth	3.4%	3.9%	1.7%	1.1%	−9.9%
Share	76.4%	75.0%	73.2%	70.8%	61.9%
INDEPENDENT TELEPHONE COMPANIES	2,765	2,906	2,979	3,053	3,150
Growth	4.5%	5.1%	2.5%	2.5%	3.3%
Share	17.7%	17.5%	17.3%	17.0%	17.0%
ATT-IS	NA	NA	NA	NA	350
Growth					NA
Share					1.9%
INTERCONNECT	931	1,238	1,635	2,190	3,565
Growth	35.0%	32.9%	32.1%	33.9%	62.8%
Share	5.9%	7.5%	9.5%	12.2%	19.2%
TOTAL	15,657	16,574	17,250	18,016	18,565
Growth	5.1%	5.9%	4.1%	4.4%	3.0%

SOURCE: NATA

Installed base refers to the cumulative total of instruments (telephone handsets) in use at the end of each calendar year. The figures for key installed base development and projections reflect stand-alone installations only. "Stand-alone" refers to key systems connected directly to telephone company central offices, as opposed to key systems installed behind a PBX or Centrex system.

An historical rule of thumb, probably valid through the 1970s, put the ratio of key instruments at 60 percent stand-alone to 40 percent behind PBX/Centrex. The use of key systems behind PBX and Centrex systems historically has been more common in telephone company installations than with interconnect. The result: a lower key behind PBX/Centrex ratio for interconnect (estimated at 22 percent) than the industry norm.

Recent market trends indicate an increasing reliance on electronic feature phones (often proprietary), rather than key sets, in new PBX installations. This results in a gradual reduction in key sets behind PBX/Centrex as a percentage of total key systems. The ratio is estimated at about 67 percent stand-alone to 33 percent behind PBX/Centrex for 1983, and is expected to continue to decline as key sets are displaced by hybrid systems, electronic feature phones, and key-inherent PBX.

A downside of this tremendous surge in interconnect sales was the continued heavy emphasis potential customers placed on price, exacerbating the already fierce price erosion in the market. A number of the larger, established interconnect vendors were unwilling to engage in further price-cutting and reported flat or slightly lower sales in 1983 compared to 1982. These companies expressed the determination to hold the line on pricing to protect their margins, and relied instead on non-sales revenues generated by service offerings to their installed base. Severe pressure on price, projected to last through 1985, is generally expected to be even worse in 1984 and 1985 than it was in 1983.

Balancing the mixed performance of some of the larger interconnects was a tremendous influx of new vendors in 1983 (possibly as many as 800, or more than a 25 percent increase), most of them quite willing to compete on the basis of price alone. Enticed by the apparent vulnerability of the Bell base and determined to exploit the confusion generated by divestiture, new entrants flooding the marketplace cut the floor out from under established pricing patterns.

The renascent BOCs have not been slow to follow suit, and are generally reported offering prices anywhere from 10 percent to 30 percent below what most established interconnect vendors can match. ATT-IS' response to generally low prices has been most evident on its embedded base products, which many vendors believe are being "given away" to forestall competitive sales. One strategy being used increasingly for meeting this rampant price erosion, by established vendors, is the provision of lease contracts rather than outright sales.

Stand-Alone Key Market: 1984 - 1988
Installed Base Projections

Instruments (000)

	1984	1985	1986	1987	1988
BELL OPERATING COMPANIES	350	725	1,110	1,475	1,850
Growth	*	107%	51.7%	34.1%	25.4%
Share	1.8%	3.6%	5.3%	6.9%	8.3%
INDEPENDENT TELEPHONE COMPANIES	3,500	3,595	3,685	3,770	3,850
Growth	11.1%*	2.7%	2.5%	2.3%	2.1%
Share	18.2%	18.1%	17.8%	17.5%	17.3%
ATT-IS	10,930	10,485	10,345	10,260	10,195
Growth	*	−4.1%	−1.3%	−0.8%	−0.6%
Share	56.8%	52.7%	50.0%	47.7%	45.6%
INTERCONNECT	4,470	5,095	5,545	5,995	6,445
Growth	26.6%	13.9%	8.8%	8.1%	7.5%
Share	23.2%	25.6%	26.8%	27.9%	28.8%
TOTAL	19,250	19,900	20,675	21,500	22,340
Growth	3.7%	3.4%	3.9%	4.0%	3.9%

SOURCE: NATA

The 22 wholly-owned Bell Operating Companies (BOCs) were divested by AT&T early in 1984 and were regrouped into seven independent companies. At the time of divestiture, the BOCs' base of approximately 11.5 million stand-alone key telephone sets was transferred to AT&T, as is reflected in the figures for 1984 and beyond. Key systems installed behind Centrex remain with the BOCs. Two companies historically counted as part of the Bell System, Southern New England Telephone and Cincinnati Bell, have not been divested but are operated as independent telephone companies. Their base has been transferred into that category in the 1984 column.

Growth rates are calculated as a percent of the previous year's base. Subtracting the base in a given year from the following year's base will yield the absolute net increase (decrease).

* Growth rates for BOCs and AT&T are not shown for 1984, because of the transfer of the installed base from the operating companies to AT&T. Growth for the Independent Telephone Companies is artificially inflated because of the transfer of Southern New England Telephone and Cincinnati Bell to this category in 1984. Without this adjustment, the growth rate for the independent telcos would have been about 3.2 percent.

While this approach is becoming an increasingly important part of the overall marketing strategy of many interconnect companies, the revenue requirements needed to support it make leasing most attractive to the larger and mid-sized vendors.

AT&T

Approximately one-half of the installed base of equipment AT&T inherited from the BOCs consists of aging 1A2 equipment, with the bulk of the remainder Com Key (introduced in 1972) and, to a lesser extent, Horizon hybrid products. Representing about 60 percent of the total market in 1984, this base will continue to be extremely vulnerable, particularly if support for electro-mechanical equipment is curtailed or discouraged by ATT-IS. All competitors, including ATT-IS and the BOCs, see this as the richest potential market to be exploited, and the projections reflect this, showing continued, though declining, erosion of the AT&T base.

ATT-IS currently has no coherent product line with which to defend its huge customer base, although the Merlin will help, especially when the announced up-size version is introduced. Initial reports suggest the Merlin is extremely popular with users, and with an expanded version it will probably provide just the vehicle ATT-IS needs to drive its marketing efforts. Large losses from the existing base are projected for 1984 and 1985, with continued but sharply declining erosion seen through 1988. ATT-IS is expected to consolidate its product-marketing strategy and re-emerge as a major competitor by the end of 1985. Even with the projected slight erosion from its base, ATT-IS

will remain the dominant player in the key market, retaining at least a 40 percent share of the total market in 1988.

Bell Operating Telcos

The BOCs, like the interconnects, are expected to see short-term gains at AT&T's expense. Some of the divested phone companies have made aggressive and, in some cases, innovative moves into the market. Their initial push in marketing and sales will probably peak around 1985-86, after which annual sales will stabilize as a category. This leveling-off for the BOCs as a whole will result largely from the impact of renewed ATT-IS success in the market.

Replacement Rates and 1A2 Equipment

The rate of replacement of the existing base is accelerating, from an average of 8.2 percent of the base per year between 1978 to 1982 to about 11 percent per year projected for 1983 through 1988. This reflects predominantly the vulnerability of the AT&T base, but the rate of replacement of interconnect equipment is also accelerating as the base ages and new equipment enters the market. Average product life is also believed to be shortening, with new key systems installed in 1984 expected to last six to eight years, down from the average eight to 12 years expected in the late 1970s.

The market for electro-mechanical (1A2) equipment remains healthy, though declining as a percent of total new installations. 1A2 products are still widely considered cost and feature effective at the very low end, and the market is expected to remain strong (although continuing to decline in terms of total market share) for the next five years. Approximately 25 percent to 30 percent of total stations shipped in 1983 were electro-mechanical.

Key Behind PBX/Centrex

Key equipment installed behind PBX is declining rapidly in the face of proprietary sets and electronic feature phones. The market behind Centrex, on the other hand, is booming as telephone companies and independent vendors try to offer users improved features and access through station equipment. An estimated 28 percent of 1983 shipments are thought to have been installed behind PBX and Centrex systems, including a substantial number installed by interconnect vendors behind new BOC Centrex systems.

1983 Key System Installed Base

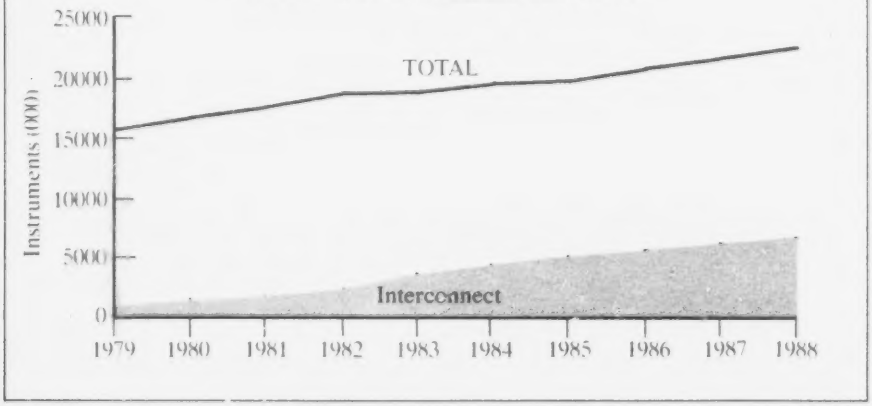
	Stations (000)	Systems (000)
Stand-Alone		
Telco	14,650	2,930
Interconnect	3,565	395
ATT-IS	350	55
Sub-Total	18,565	3,380
Behind PBX/Centrex	9,145	830
Total Market	27,710	4,210

Key System Market

For the purposes of the following table, key stations behind PBX/Centrex have been estimated to represent one-third of the total market. This estimate is lower than the historical rule-of-thumb estimate of 40 percent, and reflects the erosion in this market due to the introduction of proprietary PBX station sets and electronic feature phones. Average system size behind PBX/Centrex is estimated at 11 stations per system.

In the stand-alone market, telco-supplied systems are shown at an average five stations per system, a long-standing historical average. The interconnect base is estimated at an average of nine stations per system, down from the average of 13 stations per system, which held through the late 1970s. The decline results from the explosion in the very small (under six lines) market over the past several years. The ATT-IS base is arbitrarily estimated at 6.5 stations per system. The average for the total stand-alone market of 5.5 stations per system reflects the preponderance of the Bell base.

STAND-ALONE KEY MARKET INSTALLED BASE: 1979-1988



Shipments

Update

Estimates on key telephone instrument shipments, both historical and projected, have been revised downward to correct an overestimation based on incomplete reporting last year. Overall growth rates are almost identical to last year's projections, with the few changes discussed below. The most notable revision in this year's table is the sharp, unexpected decline in AT&T's shipments in 1983, and their projected strong comeback in 1984.

Highlights

Shipments of key telephone instruments at the Original Equipment Manufacturer (OEM) level grew by 9.8 percent in 1983, a surge largely due to the entry of new manufacturers entering the market. Overall growth in shipments is expected to average 4.7 percent between 1984 and 1988. While the market as a whole grew in 1983, AT&T's shipments slipped sharply—a slip attributed to the loss of the BOC marketing outlets together with a phasing-out of electromechanical equipment from production. Independent (non-AT&T) manufacturers scored a record market share in 1983, 71.6 percent, but AT&T will begin to regain ground in 1984 and will retain a 30 percent to 40 percent share of annual production for the foreseeable future.

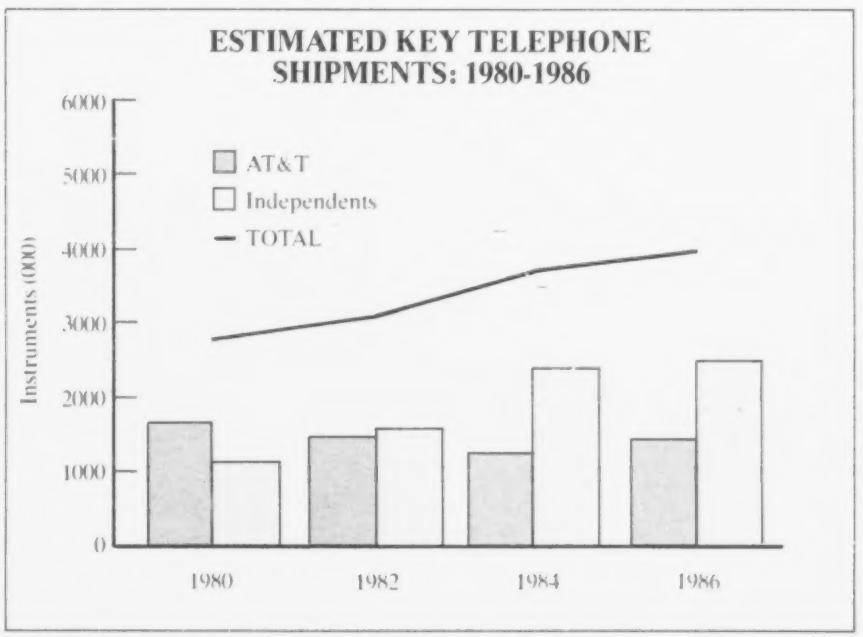
Continued Growth

Despite the overall downward revision in the estimated shipment levels and the marked decline in market share of sales for AT&T in 1983 and 1984, the overall market is in the midst of a brief surge of production. This is largely the result of an influx of new manufacturers looking to exploit the turmoil generated by deregulation and the divestiture of AT&T. New key telephone products have been introduced in the market at a rate never before seen, and many observers have compared present conditions and the recent wave of new competitors to the early interconnect days.

The vulnerability of AT&T's embedded base to replacement and the rapid rate of replacement currently occurring have to some extent justified the rush of new entrants into the manufacturing field. Prices, however, have also been depressed, and are expected to retreat even further in 1984. By 1986, the combination of thin margins and the reemergence of AT&T with a revitalized product family undoubtedly will begin forcing some of the newcomers out of the market. By 1988, the field should once again be dominated by a few prominent players.

AT&T lost much more ground in 1983 than had been projected, largely because of the phase-out of 1A2 equipment at the manufacturing level. Nevertheless, AT&T is expected to remain the dominant single supplier of key equipment in the U.S. market, with a market share of between 35 percent and 40 percent for the foreseeable future.

As noted above, replacement of the base is taking place at a faster rate than had been predicted last year, and is expected to continue at about 11 percent of the base annually. At currently projected rates, replacement accounts for between 55 percent and 60 percent of annual shipments, with key behind PBX/Centrex representing another 20-25 percent. 1A2 equipment still accounted for between 25 percent and 30 percent of total shipments in 1983, and will continue to show healthy activity despite a declining market share over the next five years.



Key Market: 1979 - 1983
Estimated Manufacturers' Shipments

Instruments (000)

	1979	1980	1981	1982	1983
AT&T	1,730	1,635	1,540	1,450	950
Share	63.8%	58.4%	53.1%	47.5%	28.4%
INDEPENDENT MANUFACTURERS	980	1,165	1,360	1,600	2,400
Share	36.2%	41.6%	46.9%	52.5%	71.6%
TOTAL	2,710	2,800	2,900	3,050	3,350
Growth	3.5%	3.3%	3.6%	5.2%	9.8%
DOLLARS (millions)	$772	$826	$870	$915	$967
Growth	5.3%	7.0%	5.3%	5.2%	5.7%

SOURCE: NATA

The figures show estimates of total shipments at the OEM (Original Equipment Manufacturer) level intended for the U.S. market, including imports. "Independent Manufacturers" refers to all non-AT&T key manufacturers, for which interconnect companies and the independent telcos have traditionally offered market outlets.

Through 1982, essentially all of AT&T's products were marketed through the Bell Operating Companies (BOCs), and the BOCs historically installed virtually no non-AT&T key equipment (the exception being a small number of electro-mechanical key system units and circuit boards). Beginning in 1984, all of the seven divested BOCs began marketing non-AT&T equipment. In contrast to the PBX market, the manufacturing of non-WECo key equipment for the U.S. market has increasingly moved offshore, and the majority of the key equipment presently on the market originates in foreign countries, predominantly in the Far East.

Key Market: 1984 - 1988
Projected Manufacturers' Shipments

Instruments (000)

	1984	1985	1986	1987	1988
AT&T	1,200	1,350	1,450	1,500	1,500
Share	32.9%	35.1%	36.3%	36.1%	35.7%
INDEPENDENT MANUFACTURERS	2,450	2,500	2,550	2,650	2,700
Share	67.1%	64.9%	63.7%	63.9%	64.3%
TOTAL	3,650	3,850	4,000	4,150	4,200
Growth	8.9%	5.5%	3.9%	3.8%	1.2%
DOLLARS (millions)	$1,022	$1,078	$1,160	$1,245	$1,260
Growth	5.7%	5.5%	7.6%	7.3%	1.2%

SOURCE: NATA

Note that the estimated shipments include equipment destined for key behind PBX/Centrex applications as well as for the stand-alone market. It is assumed that in the 1978 to 1982 period, approximately 30 percent of total shipments were installed behind PBX and Centrex systems. This ratio is lower in the interconnect market than is the industry norm. The percentage of total shipments going in behind PBX/Centrex systems is projected to decline from 33 percent in 1982 to 25 percent in 1988 because of the trend toward the use of proprietary feature phones.

PBX-Centrex Market

Installed Base

Update

The Bell Operating Companies (BOCs) reported a substantial erosion of their PBX equipment base in 1983 (almost 14 percent of total instruments) but showed a 2.4 percent increase in Centrex lines, reversing a two year trend for these systems. The BOCs' success in revitalizing Centrex holds profound significance for the future of the PBX market. Much of the growth which had been projected for PBX was expected to come from change-outs by Centrex users, but the renewed growth in Centrex in 1983 suggests that the BOCs will be able to market the service successfully against PBX-based products through the projected period. This continued increase in Centrex, even if at lower levels than growth in the combined PBX-Centrex market, will reduce by almost half the projected growth rates in the PBX market, from 8.4 percent average annual growth projected last year, to 4.5 percent projected this year. This reduced growth will drastically slow the pace of expansion by interconnect vendors.

Highlights

The combined base of PBX-Centrex instruments grew by 3.7 percent in 1983, a little below the 4.2 percent average annual growth rate projected through 1988. The PBX base grew by 4.5 percent, roughly half the rate of 1982 growth, reflecting the turnaround in the Centrex market and its surprisingly healthy growth after two years of decline. The interconnect base grew by a healthy 21 percent, largely because of erosion of the BOC base, but this rate will decline quickly to a projected 7.1 percent average annual growth through 1988.

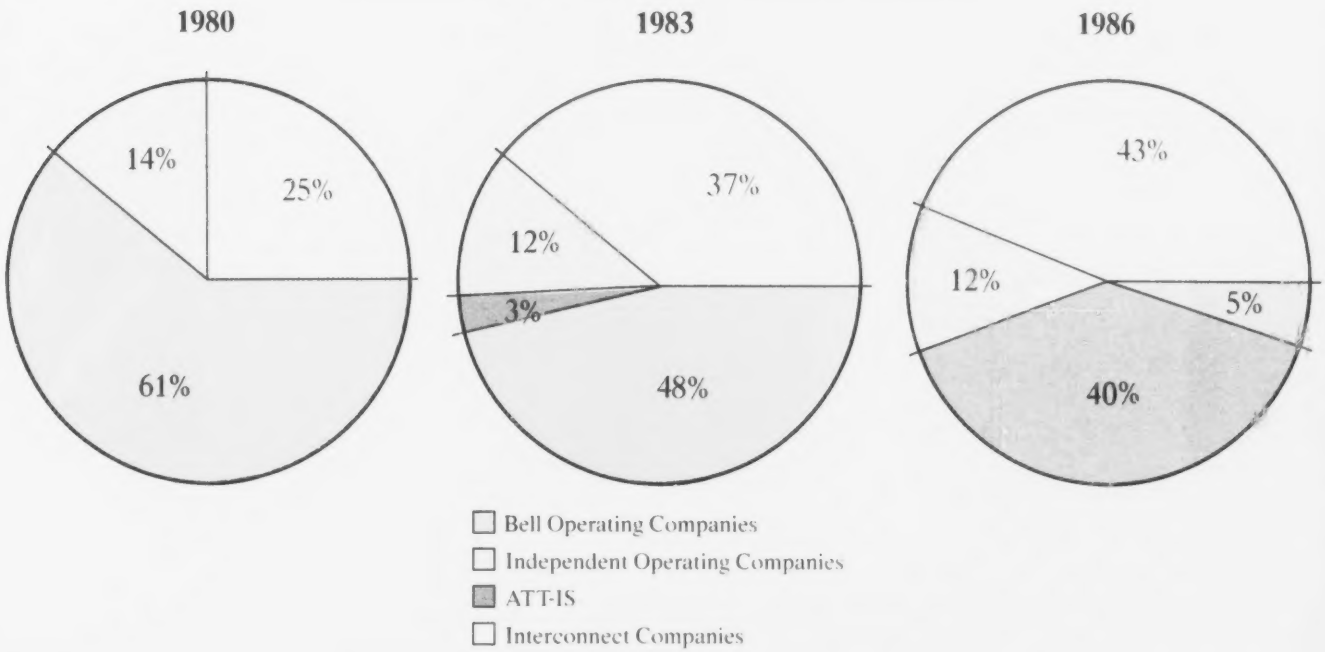
This year's projections reflect a pessimistic set of assumptions for the PBX market, particularly for continued interconnect growth:

- The combined base of PBX-Centrex equipment will continue to grow at a steady rate of about four percent annually.
- Centrex will reverse its recent decline and grow by 3-3.5 percent annually. This will cut last year's projected growth for PBX almost in half, from about 8.4 percent to 4.5 percent.
- AT&T will emerge as a strong competitor in 1986, but will be primarily concerned with retaining existing customers and upgrading its installed base, resulting in relatively low growth projected through 1988.
- The BOCs will emerge as extremely strong competitors, marketing both Centrex and general trade PBX products.

Interconnect

The interconnect industry experienced strong growth in 1983, and can expect a modestly good year in 1984. The installed base grew by 21 percent in 1983, and interconnect sales represented approximately 57 percent of all installations in the PBX market, up from about 41 percent in 1982. But at the same time that sales volume increased significantly, prices were further depressed in

PBX MARKET INSTALLED BASE BY VENDOR



PBX-CENTREX MARKET: 1979 - 1983
Installed Base Development

	Instruments (000)				
	1979	1980	1981	1982	1983
PBX					
Bell Operating Companies	9,830	10,106	10,460	10,795	9,825
Growth	0.9%	2.8%	3.5%	3.2%	−8.9%
Share	63.1%	60.6%	58.6%	55.7%	48.5%
Independent Telephone Companies	2,307	2,368	2,431	2,410	2,450
Growth	7.9%	2.6%	2.7%	−0.8%	1.7%
Share	14.8%	14.2%	13.6%	12.4%	12.1%
ATT-IS	NA	NA	NA	NA	500
Growth					NA
Share					2.5%
Interconnect	3,452	4,211	4,969	6,173	7,470
Growth	26.0%	22.0%	18.0%	24.2%	21.0%
Share	22.1%	25.2%	27.8%	31.9%	36.9%
TOTAL PBX	15,589	16,685	17,860	19,378	20,245
Growth	6.7%	7.0%	7.0%	8.5%	4.5%
CENTREX					
Bell Operating Companies	7,724	7,941	7,890	7,387	7,565
Independent Telephone Companies	541	556	544	524	480
TOTAL CENTREX	8,265	8,497	8,434	7,911	8,045
TOTAL PBX-CENTREX	23,854	25,182	26,294	27,289	28,290
Growth	6.2%	5.6%	4.4%	4.4%	3.7%

SOURCE: NATA

Installed base refers to the cumulative total of instruments (telephone handsets or equipped lines) in use at the end of each calendar year.

The projected figures for PBX and Centrex installed base reflect the transfer of assets to AT&T in early 1984 as part of the divestiture process. At that time, the 22 divested Bell Operating Companies (BOCs) transferred their entire base of in-place PBX equipment to AT&T. Following divestiture, the 22 BOCs were regrouped into seven independent Regional Operating Companies (ROCs) and began operations with no installed base of PBX equipment. The divested ROCs did retain their base of Centrex equipment.

1983 from their 1982 levels. The result was generally lower profit margins for vendors. The pressure on prices will continue to squeeze vendors through at least 1985, and probably into 1986.

The strong surge in sales volume in 1983 must be seen in the context of that year's competition. The interconnect industry in 1983 was faced with the weakest competition in its history. The BOCs were constrained from marketing new equipment, and AT&T was grappling with tremendous personnel and other start-up problems, not least among them the question of what name it would be able to use.

In 1984 this trend will continue to some extent, but signs of renewed strength in ATT-IS and at least some of the BOCs are already apparent. While ATT-IS has maintained a relatively quiet presence in the market to date, almost every interconnect vendor interviewed reported potential sales forestalled by

PBX-CENTREX MARKET: 1984 - 1988
Installed Base Projections

Instruments (000)	1984	1985	1986	1987	1988
PBX					
Bell Operating Companies	350	750	1,200	1,650	2,100
Growth	*	114%	60.0%	37.5%	27.3%
Share	1.7%	3.4%	5.2%	6.8%	8.3%
Independent Telephone Companies	2,755	2,815	2,870	2,920	2,970
Growth	12.4%*	2.2%	1.9%	1.7%	1.7%
Share	13.0%	12.7%	12.4%	12.1%	11.7%
ATT-IS	9,510	9,410	9,490	9,580	9,740
Growth	*	−1.1%	0.9%	1.0%	1.7%
Share	44.9%	42.5%	40.9%	39.5%	38.5%
Interconnect	8,570	9,160	9,645	10,075	10,475
Growth	14.7%	6.9%	5.3%	4.5%	4.0%
Share	40.5%	41.4%	41.6%	41.6%	41.4%
TOTAL PBX	21,185	22,135	23,205	24,225	25,285
Growth	4.6%	4.5%	4.8%	4.4%	4.4%
CENTREX					
Bell Operating Companies	7,705	7,975	8,255	8,545	8,845
Independent Telephone Companies	610	600	590	580	570
TOTAL CENTREX	8,315	8,565	8,845	9,125	9,415
TOTAL PBX-CENTREX	29,500	30,700	32,050	33,350	34,700
Growth	4.3%	4.1%	4.4%	4.1%	4.0%

SOURCE: NATA

Two companies historically considered Bell Operating Companies, Southern New England Telephone and Cincinnati Bell, were not divested and are operated as independent telcos. As a result, their base of both PBX and Centrex equipment has been shifted to the independent telco category in 1984 and beyond.

Growth rates are calculated as a percent of the previous year's base. Subtracting the base in a given year from the following year's base will show the absolute net increase (decrease).

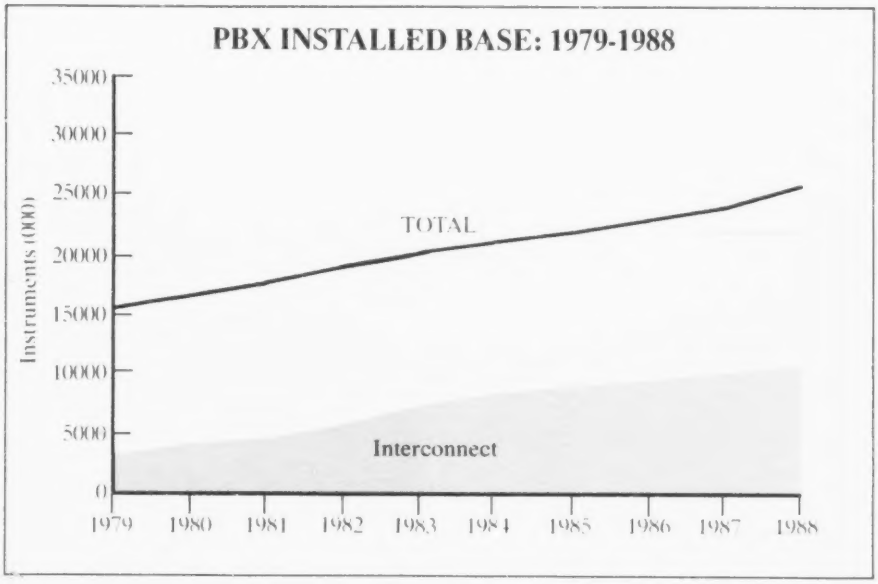
*PBX growth rates for the Regional Operating Companies and AT&T are not shown in 1984 because of the transfer of the installed base from the operating companies to AT&T. Growth rates for the Independent Telephone Companies are artificially inflated because of the transfer of Southern New England Telephone and Cincinnati Bell to this category in 1984.

extremely low prices offered on embedded-base equipment. The typical ATT-IS strategy at this time seems to be to attempt to migrate customers interested in upgrades to more modern AT&T equipment. Often ATT-IS promises a reduction or cancellation of so-called contract termination charges. Where this tactic fails, ATT-IS often offers the customer very low sales prices for the in-place equipment, frequently convincing customers to buy the embedded equipment rather than a new system from an independent vendor.

The reemergence of ATT-IS and the various BOCs as strong competitors, together with the projected revitalization and renewed growth in Centrex services, will leave little room for interconnect growth in the late 1980s. By year-end 1985 the interconnect installed base of PBX equipment will have reached a stable market-share level, and growth beyond that date is anticipated at modest

levels comparable to the growth of the base as a whole. While this development has been foreseen for some time (see *1982 Review*), its actual arrival will be accelerated by the renewed growth in Centrex and the emergence of the divested BOCs as aggressive vendors of general trade (non-AT&T) PBX equipment.

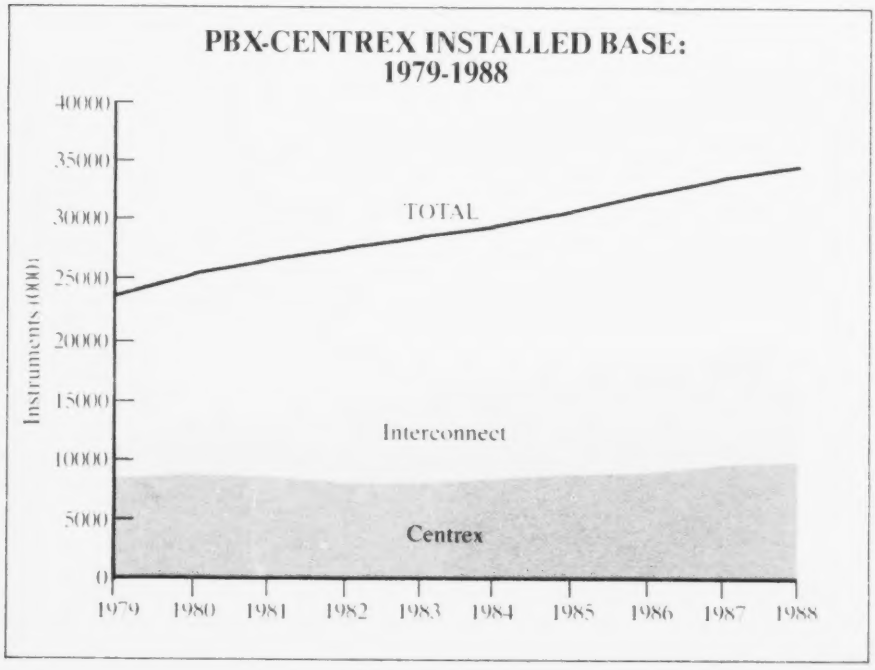
The shift to sharply reduced growth rates for the installed base will be accompanied by considerable dislocation in the vendor market, and will cause interconnect companies to shift to newer, more innovative services and to turn to their own installed bases for increased upgrade and service offerings. This shift may precipitate a new round of acquisitions and consolidation among vendors as companies strive to develop a large enough base from which to generate upgrade and service revenues sufficient for survival.



ATT-IS

AT&T's installed base of PBX equipment, predominantly the analog Dimension product, is not as immediately vulnerable to displacement by the BOCs and interconnect suppliers as is its key system base. Customer demand for digital switching, while growing, is still not overwhelming, and most Dimension users seem content to wait for System 85 and 75 switches. Nevertheless, ATT-IS is expected to place a great deal of emphasis over the next several years on maintaining its established customer base and guiding users through the difficult upgrade from Dimension to System 85 (75).

ATT-IS will continue to lose installed base to competitors over the next two years (about 13 percent of the year-end 1982 Bell base will have been lost by year-end 1985). By mid- to late-1985, however, ATT-IS is expected to have consolidated its product mix and marketing strategy and will re-emerge as a powerful contender in the PBX market. For the present, ATT-IS' principal marketing goal will remain the protection of its existing customer base through customer migration to new products, resulting in small annual net increases to its installed base.



BOCs and the Future of Centrex

BOC performance in the CPE market to date has been extremely mixed, with some (notably U S WEST and Ameritech) entering the market and competing quite successfully with interconnect vendors, while others—Southwestern Bell and Bell Atlantic, in particular—beleaguered by problems and confusion, are reportedly having difficulty moving products. Reports on the remaining companies (Pacte!, NYNEX and Bell South) are mixed but seem to indicate a much stronger second quarter 1984 than first. Unfortunately, the divested BOCs have simply not been in the market long enough to accurately evaluate how successful each of the BOCs will be, though most interconnect vendors expect

PBX MARKET: 1979 - 1983
Estimated Manufacturers' Shipments

Instruments (000)

	1979	1980	1981	1982	1983
AT&T	1,240	1,200	1,160	1,000	800
Share	50.0%	45.1%	40.5%	32.5%	24.5%
INDEPENDENT MANUFACTURERS	1,242	1,460	1,705	2,080	2,470
Share	50.0%	54.9%	59.5%	67.5%	75.5%
TOTAL SHIPMENTS	2,482	2,660	2,865	3,080	3,270
Growth	8.9%	7.2%	7.7%	7.5%	6.2%
DOLLARS (millions)	$820	$878	$955	$1,026	$1,093
Growth	9.0%	7.0%	8.8%	7.4%	6.5%

SOURCE: NATA

The figures show estimates of total shipments at the OEM (Original Equipment Manufacturer) level intended for the U.S. market, including imports. Unlike the key market, imports account for a very small percentage of total PBX shipments, although a number of foreign firms maintain manufacturing plants in the United States.

PBX MARKET: 1984 - 1988
Projected Manufacturers' Shipments

Instruments (000)

	1984	1985	1986	1987	1988
AT&T	900	1,000	1,050	1,100	1,150
Share	25.8%	27.7%	28.1%	28.6%	28.8%
INDEPENDENT MANUFACTURERS	2,590	2,615	2,685	2,745	2,845
Share	74.2%	72.3%	71.9%	71.4%	71.2%
TOTAL SHIPMENTS	3,490	3,615	3,735	3,845	3,995
Growth	6.7%	3.6%	3.3%	2.9%	3.9%
DOLLARS (millions)	$1,162	$1,190	$1,245	$1,305	$1,390
Growth	6.3%	2.4%	4.6%	4.8%	6.5%

SOURCE: NATA

Beginning in 1983, AT&T shifted its primary market outlets from the Bell Operating Companies to AT&T's unregulated subsidiary, AT&T Information Systems. Following their divestiture, the seven newly formed Regional Operating Companies began marketing non-AT&T equipment and are expected to become major outlets for competitive manufacturers.

even the weaker companies to emerge as extremely strong competitors.

The most surprising news from the BOCs this year concerns the rebound in Centrex services, from a 6.4 percent decline in 1982 to a 2.4 percent increase in 1983. This rebound reflects the BOCs' success in winning rate stabilization plans and rate reductions in the states, as well as their aggressive marketing of the central office-based service and its enhancement through lower line size configurations and added feature packages. The magnitude of this turnaround, together with the short period of time in which it was achieved, indicates that Centrex will continue to be a viable market product for the foreseeable

future.

Strongly reinforcing this expectation is the fact that, since the autumn of 1983, the BOCs have been successful in winning further state rate reductions offsetting federal access charges. Consequently, rather than the steady decline projected last year, NATA is now predicting a steady increase for BOC Centrex installations through 1988. In contrast to the BOC success with Centrex, in 1983 the independent operating companies reported another sharp decline in Centrex lines. Whether this decline will continue in 1984 and beyond is unclear, particularly in light of GTE's declared determination to hold on to and expand its base of Centrex users. For our projections, we assume a continued, though very slight annual reduction in the independent phone companies' base of Centrex.

Shipments

Update

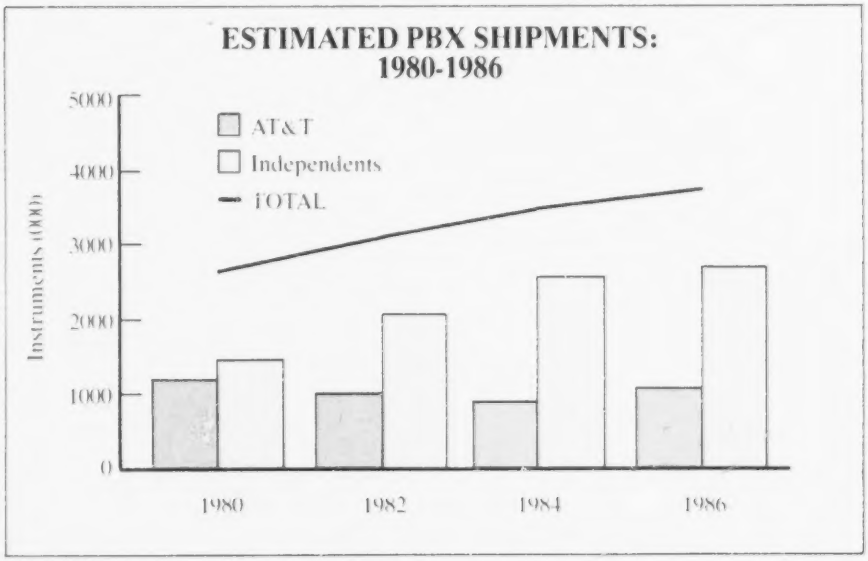
Historical dollar volumes for PBX shipments have been revised upward, to reflect more comprehensive data collected this year. Historical total volumes have been left as reported last year, with minor adjustments between categories.

Projections have been completely reworked, both to reflect higher per-line dollar values and to reflect the recent turnaround in Centrex growth. As a result of renewed growth in Centrex, PBX growth projections have been lowered from the 7 percent forecast last year to a projected 4.1 percent this year.

Highlights

PBX shipments grew by about 6.2 percent in 1983 despite a sharper-than-anticipated drop in AT&T's shipments. Overall growth in shipments is expected to average only 4.1 percent through 1988, down sharply from the 7.5 percent average annual growth between 1979 and 1983. The rebirth of Centrex will slash projected growth rates for PBX manufacturers, and may stimulate development schedules on so-called fourth generation products as a means of competing with the central office-based service. AT&T is expected to begin regaining market share in 1984, although without the BOCs as market outlets AT&T probably will not achieve pre-divestiture shipment levels. Non-AT&T manufacturers are expected to retain about 70 percent of total shipments through the forecast period.

ESTIMATED PBX SHIPMENTS: 1980-1986



BELL PBX MOVEMENT

"January 1" indicates the accumulated installed base of PBX-Centrex instruments for the Bell Operating Companies (BOCs) at the beginning of 1982. "Inward" refers to all PBX-Centrex instruments installed by the BOCs during the year, whether as additions to existing systems, replacements of older equipment with new equipment, or as completely new installations. "Outward" refers to all PBX-Centrex instruments removed by Bell during the year. "December 31" shows the net installed base at the end of the year.

Bell PBX-Centrex Instrument Movement by State: 1983

	JANUARY 1	INWARD	OUTWARD	DECEMBER 31	% CHANGE
ALABAMA	223,300	42,100	49,400	216,000	— 3.3%
ARIZONA	238,300	42,400	64,200	216,500	— 9.1%
ARKANSAS	82,700	13,100	18,800	77,000	— 6.9%
CALIFORNIA	2,100,300	282,900	417,100	1,966,100	— 6.4%
COLORADO	340,500	47,100	77,900	309,700	— 9.0%
CONNECTICUT	352,900	43,100	56,700	339,300	— 3.9%
DELAWARE	83,300	12,600	15,100	80,800	— 3.0%
D.C.	483,300	51,300	59,400	475,200	— 1.7%
FLORIDA	582,800	88,100	103,100	567,800	— 4.2%
GEORGIA	431,100	67,500	82,900	415,700	— 3.6%
IDAHO	56,300	6,700	9,100	53,900	— 4.3%
ILLINOIS	1,084,500	133,700	182,400	1,035,800	— 4.5%
INDIANA	285,000	27,400	28,800	283,600	— 0.5%
IOWA	179,400	[Embedded Base Transferred to ATT—IS June, 1983]			
KANSAS	159,400	22,400	27,900	153,900	— 3.9%
KENTUCKY	136,900	21,400	33,500	124,800	— 8.8%
LOUISIANA	300,500	46,100	58,500	288,100	— 4.1%
MAINE	63,400	5,700	10,100	59,000	— 6.9%
MARYLAND	490,800	55,400	63,600	482,600	— 1.7%
MASSACHUSETTS	623,500	82,400	122,400	583,500	— 6.4%
MICHIGAN	742,200	29,200	109,800	661,600	— 10.9%
MINNESOTA	379,800	87,500	93,700	373,600	— 1.6%
MISSISSIPPI	144,500	19,800	34,300	130,000	— 10.0%
MISSOURI	373,500	48,100	77,100	344,500	— 7.8%
MONTANA	51,200	3,700	19,800	35,100	— 31.5%
NEBRASKA	87,100	21,200	22,800	85,500	— 1.8%
NEVADA	44,700	8,900	9,100	44,500	— 0.5%
NEW HAMPSHIRE	68,800	12,300	14,800	66,300	— 3.6%
NEW JERSEY	824,600	130,400	160,200	794,800	— 3.6%
NEW MEXICO	90,000	8,200	14,600	83,600	— 7.1%
NEW YORK	1,566,700	164,000	301,600	1,429,700	— 8.7%
NORTH CAROLINA	274,000	42,000	55,200	260,800	— 4.8%
NORTH DAKOTA	50,900	7,700	13,100	45,500	— 10.6%
OHIO	648,700	86,500	142,800	592,400	— 8.7%
OKLAHOMA	239,100	29,600	47,800	220,900	— 7.6%
OREGON	191,100	25,300	41,500	174,900	— 8.5%
PENNSYLVANIA	947,700	107,400	165,700	889,400	— 6.2%
RHODE ISLAND	71,700	3,100	12,800	62,000	— 13.5%
SOUTH CAROLINA	185,700	27,800	39,200	174,300	— 6.1%
SOUTH DAKOTA	42,300	14,000	14,500	41,800	— 1.2%
TENNESSEE	267,000	60,600	86,700	240,900	— 9.8%
TEXAS	1,151,700	184,900	257,100	1,079,500	— 6.3%
UTAH	100,700	9,300	22,400	87,600	— 13.0%
VERMONT	31,900	4,600	4,800	31,700	— 0.6%
VIRGINIA	486,000	55,900	60,400	481,500	— 0.9%
WASHINGTON	349,200	59,000	71,400	336,800	— 3.6%
WEST VIRGINIA	107,600	12,700	18,400	101,900	— 5.3%
WISCONSIN	315,900	31,900	123,600	224,200	— 29.0%
WYOMING	49,500	4,200	7,100	46,600	— 5.9%
TOTAL	18,182,000	2,391,200	3,522,700	16,871,000	— 7.2%

SOURCE: FCC (Figures include Centrex.)

Interconnect and Retail Markets

Interconnect Sales and Revenue

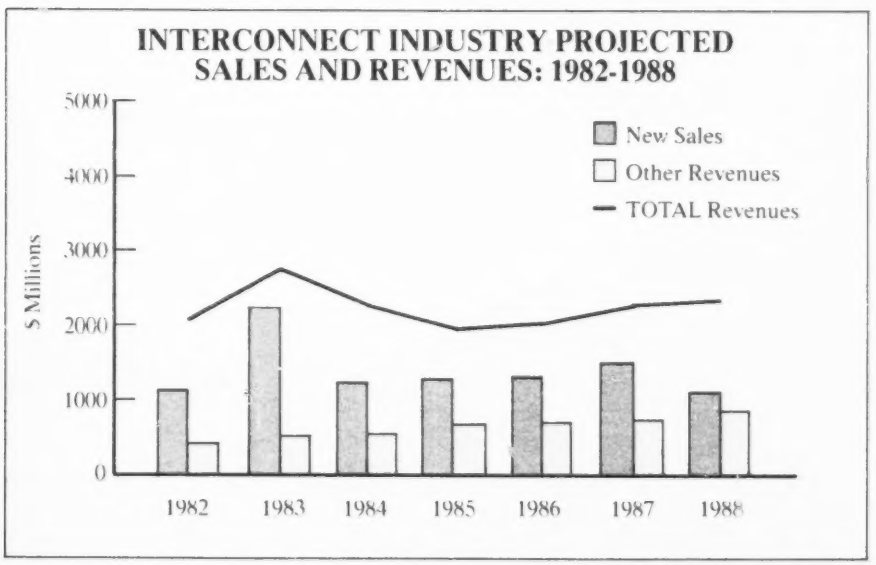
As readers of last year's *Statistical Review* will recognize immediately, the current projections for interconnect sales and revenues bear little or no resemblance to those published last year. Various developments over the past year, most of which were impossible to anticipate last fall, have led us to reevaluate the entire pattern of the telecommunications equipment industry's recovery from the twin shocks of divestiture and deregulation. The unexpectedly strong recovery of Centrex in the BOC operating areas and AT&T's decision in December 1983 to offer sales options on embedded multi-line CPE immediately upon divestiture were two such developments. The huge shift of BOC customers to interconnect last year and the early, aggressive entry of some of the newly divested BOCs were also unforeseen last year.

Market conditions and the legal and regulatory environments are still in flux, and many of the assumptions underlying this year's projections may also have to be reevaluated next year. Nevertheless, the following reflects NATA's best estimates based on actual market conditions at the moment. We believe they present the most realistic picture available of future trends in the industry.

Highlights

The outlook for the interconnect industry presented this year is much less optimistic than were last year's projections. The revival of Centrex, resulting in lower aggregate growth rates in the equipment markets, stronger projected competition from the divested BOCs, and continued punishing price erosion all contribute to this year's lower figures. Also, the larger-than-foreseen surge in sales volume in 1983 further distorts the projected growth pattern. The expected downturn in sales in 1984 and 1985 appears even greater in contrast to 1983's artificial peak than they would if last year had followed normal patterns.

Other revenues, primarily from expansion of existing systems, moves, changes, and service, are increasing rapidly as a percent of total revenues. While actual performance varied dramatically among companies, many more companies reported significant revenue from this category in 1983 than in 1982, and the relative contributions were higher. With the projected downturn in sales revenues, this category is expected to be pushed even higher as companies turn to their installed base for needed revenue.



Interconnect Sales

Nineteen eighty three was a record year for interconnect, but one which will not soon be repeated. With the BOCs temporarily barred from the market, and ATT-IS caught up in the massive personnel and policy shifts involved in its start-up, interconnect companies were the only stable and established equipment sources to which users could turn. Even at that, the market presented a very turbulent picture for 1983. Established interconnect vendors, large and small, reported performances for 1983 ranging from fantastic growth, to sales well below 1982 levels. The deciding factor in most cases seems to have been willingness to compete on price, with those companies hesitant to cut prices at the expense of margins reporting lower growth than those willing to make the sale at any price. At the same time, almost everyone contacted this year commented on the flood of new entrants into the sales arena last year. The pace of entry into the market reminded many of those interviewed of the heyday of interconnect growth in the early 1970s. As in those early days of the industry, many, if not most, of the newcomers seemed content to market equipment and services on the basis of price alone. While undoubtedly successful in generating sales volume for new companies, this strategy has destroyed established pricing practices in the industry and in most cases cut margins drastically.

Nineteen eighty four should also be a relatively strong year for interconnect in terms of volume, though down from 1983's high, and sales revenues will be further depressed by continued price cutting. The moderate decline in volume from last year is predicated on the reentry of the BOCs into the market and a stronger performance from AT&T.

The BOCs, now selling the same general trade equipment interconnect vendors have handled for years, have shown every indication that they are willing to buy their way into the market through low prices, with many independent dealers reporting quotes ranging from 10 to 30 percent below interconnect offers. This, together with the scramble by new interconnects to maintain volume (and thus cash flow) in a

Interconnect Industry Projected Sales and Revenues: 1982 - 1988

	STATIONS (000)	SALES ($M)	OTHER REVENUE ($M)	TOTAL REVENUE ($M)
1982				
PBX	1,255	$1,098		
KTS	600	$ 534		
TOTAL	1,855	$1,632	$ 425	$2,057
1983				
PBX	1,420	$1,135		
KTS	1,410	$1,100		
TOTAL	2,830	$2,235	$ 520	$2,755
1984				
PBX	1,295	$ 975		
KTS	995	$ 720		
TOTAL	2,290	$1,695	$ 560	$2,255
1985				
PBX	995	$ 700		
KTS	825	$ 600		
TOTAL	1,820	$1,300	$ 615	$1,915
1986				
PBX	1,105	$ 760		
KTS	730	$ 565		
TOTAL	1,835	$1,325	$ 675	$2,000
1987				
PBX	1,035	$ 855		
KTS	780	$ 665		
TOTAL	1,815	$1,520	$ 745	$2,265
1988				
PBX	1,055	$ 895		
KTS	840	$ 735		
TOTAL	1,895	$1,630	$ 820	$2,450

SOURCE: NATA

These figures show annual sales and service revenues for interconnect vendors at the end-user level. They are not cumulative. Figures for key systems and instruments refer to stand-alone installations only. "Other" revenues are generated by service offerings, lease revenue, and secondary sales to established customers. Dollar figures are in current dollars. It should be noted that these figures represent approximate industry averages, and that actual prices per line and revenue ratios vary tremendously from company to company.

stagnant market, will undoubtedly lead to a more concentrated market structure. The BOCs as a group will continue to gain ground, though some of the individual companies may be led to reevaluate their commitment to the market. Also, by year-end 1985, AT&T should have consolidated its product and marketing strategies and be ready to defend its installed base from encroachment more rigorously.

Nineteen eighty six will probably not see much improvement over 1985, although prices are expected to moderate. Nineteen eighty seven and 1988 should see a return to moderate growth, but sales increasingly will be driven by upgrades of in-place interconnect equipment.

Replacement

Chaotic market conditions mask the fact that the interconnect market is maturing, approaching what is expected to be a relatively stable market share and beginning to show its age. Specifically, an increasing proportion of the equipment installed during the high-growth years of the late 1970s is coming up for replacement every year. Almost all vendors still report that upgrading in-place interconnect supplied equipment accounts for less than 5 percent of total installations, but replacement is expected to rise to around 50 percent of all interconnect installations by the end of the projected period. In order to protect this stable base of established customers, however, successful companies will have to enhance existing service offerings and expand their product lines to include a full range of office automation products. Though weaned from the all-encompassing embrace of Ma Bell, customers will still put a premium on "one-stop shopping" and reliable, efficient service.

Retail Market

The fledgling retail market for telephone equipment, primarily single-line sets for residential use, has been at least as turbulent in the past two years as has the multi-line business market. While the FCC opened the residential market to customer-owned equipment in 1977, these customers were slower to take advantage of competitive offerings than were their business counterparts. Until equipment charges were unbundled from monthly service charges and itemized on their bills, consumers had no easy way of knowing how much they were paying for the rented telephone sets, and most seemed unaware they had any alternative to the traditional phone company-provided instrument. Demand at the retail level remained sluggish until 1982, when press reports on the deregulation of the customer premises equipment market and on the AT&T divestiture decision began appearing regularly. AT&T advertisements for purchase options on in-place equipment further spurred the growth of consumer awareness, and customers began taking advantage of their options at an astounding rate.

Accurate figures on retail sales levels are, as yet, elusive, with estimates on 1983 sales varying widely from 19.7 million units reported by the Electronic Industries Association to AT&T's estimate of 15 million sets. On the other hand, the BOCs reported the loss of 22.7 million residential sets in 1983, and the independent telcos also experienced an overall loss of residential equipment. While it is impossible to estimate accurately how many of these in-place telephones were purchased by consumers and how many were displaced by equipment bought in the retail market, AT&T Consumer Products' projections on total retail sales, widely quoted in the press, are included here for reference.

Retail Sales of Telephone Equipment

	Units*		$Value*		Average Price*	
	1984	1985	1984	1985	1984	1985
Telephones	31.1	34.5	$1,240	$1,475	$40	$43
Corded	25.0	28.0	$ 750	$ 975	$30	$35
Cordless	6.1	6.5	$ 490	$ 500	$80	$77
Answerers	2.7	3.5	$ 200	$ 290	$74	$83

*Units and value in millions. Value and pricing at factory level.

SOURCE: AT&T Consumer Products

A recent trend of particular interest to interconnect vendors is the introduction of small (typically 4″×6″ and smaller) electronic key systems by traditional retail and office equipment outlets. Both Sears and Radio Shack, for instance, provide their own installation and service technicians, and report small key products have been moving quite well. "Off-the-shelf" key systems, while much discussed in the trade press recently, do not seem to be a factor in the market yet, although at least one major retailer contacted indicated it was investigating the idea with a great deal of interest.

Subscriber Access Lines by Type of Service: 1983

	Lines (000)
AT&T	
Main Telephones:	
Residential	50,037.1
Business	11,155.9
PBX Trunks	1,802.9
Centrex CO Lines	5,479.8
Centrex Trunks	132.3
Exchange Lines Terminated in CPE:*	
Residential	11,149.4
Business	2,377.9
PBX Trunks	735.0
Other Equivalent Main	3,692.9
Total AT&T	86,563.2
Southern New England & Cincinnati Bell	
Main Telephones:	
Residential	1,553.2
Business	258.9
PBX Trunks	31.8
Centrex CO Lines	132.8
Centrex Trunks	1.8
Exchange Lines Terminated in CPE:*	
Residential	62.4
Business	55.2
PBX Trunks	22.1
Other Equivalent Main	140.1
Total SNET & CBI	2,258.3
Independent Telephone Companies	
Business	3,065.8
Centrex	305.3
PBX Trunks	504.7
Residential	18,166.1
Other Equivalent Main	298.8
Total Independents	22,331.7
TOTAL SUBSCRIBER ACCESS LINES	111,153.2

*Optional Reporting

SOURCE: AT&T, FCC, USTA

U.S. Balance of Trade

U.S. Trade Statistics

The U.S. balance of trade in telephone and switching equipment showed a net deficit of $350 million in 1983. Imports grew by 124 percent in 1983, while exports declined by one percent. Japan accounted for the largest share of U.S. imports, with 33 percent of the total, and the Far East as a whole provided 75 percent of the equipment imported. Imports from the Far East also showed the greatest percentage increase, with telephone imports alone growing by 775 percent.

The two major factors driving this erosion in the U.S. trade position were the over-valuation of the dollar and the recent explosion of retail telephone sales. While it has become a cliché to blame the dollar for trade problems, it is hard to explain the decline in exports any other way, and the dollar's over-valuation undoubtedly contributed to the rising level of imports as well. Telephone instruments as a category saw the largest percentage increase (205 percent), corresponding with the surge in the retail market since 1982. The huge inventory glut in cordless and one-piece telephones, together with apparent consumer dissatisfaction with some poor quality retail equipment imports may lead to a correction in this category in 1984.

Some analysts have blamed the AT&T divestiture and the switch by the BOCs to general trade vendors for the deteriorating U.S. trade position, but it is doubtful that divestiture had much impact on the 1983 figures as the BOCs were not yet buying equipment in 1983.

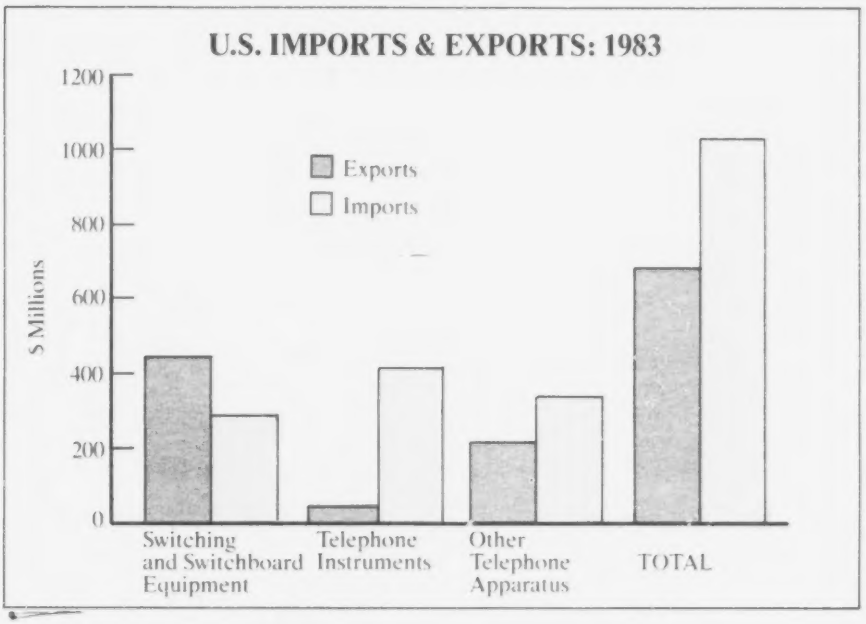
U.S. Balance of Trade in Telephone and Telephone Switching Equipment: 1983

($000)

	Switching and Switchboard Equipment	Telephone Instruments	Other Telephone Apparatus	TOTAL
Imports				
Japan	$145,437	$110,151	$84,765	$340,353
Canada	97,806	7,837	60,829	166,472
West Europe (EEC)	5,028	3,994	8,412	17,434
Sweden	5,599	45	5,295	10,939
Latin America	6,706	3,568	3,624	13,898
Israel	4,546	1,782	27,873	34,201
Far East (excluding Japan)	10,301	287,393	134,612	432,306
Other	666	288	3,878	4,832
TOTAL	$276,089	$415,058	$329,288	$1,020,435
Exports				
Japan	$4,474	$835	$9,372	$14,681
Canada	38,214	5,591	33,407	77,212
West Europe (EEC)	33,301	3,673	30,796	67,770
Sweden	913	143	4,377	5,433
Latin America	30,487	5,516	41,119	77,122
Israel	19,867	393	1,182	21,442
Far East (excluding Japan)	191,144	3,103	35,870	230,117
Other	121,507	8,460	47,135	177,102
TOTAL	$439,907	$27,714	$203,258	$670,879

The International Trade Commission (ITC) released in June 1984 a major study of the U.S. telecommunications industry after the Bell breakup. The study, *Changes in the U.S. Telecommunications Industry and the Impact on U.S. Trade*, contains a number of important conclusions:

- Imports of telecommunications equipment as a percent of the total U.S. market in 1983 ranged from a high of 18.7 percent for customer premises equipment to 6.4 percent in transmission equipment, 2.7 percent in cable, wire, and fiber optics and 0.9 percent in switching equipment (central office).
- The value of imports of all telecommunications products is expected to rise from $1.9 billion in 1984 to $5.4 billion in 1993, while the value of total domestic production of telecommunications products will expand only from $17.8 billion to $38.3 billion in the same period.
- The United States will continue to hold only small shares of foreign telecommunications markets (3 percent in 1978; 3.7 percent in 1983) with the value of exports as a percentage of total shipments declining from 7.5 percent of product shipped to 6.4 percent in 1993.



While projected total penetration of imports in the U.S. telecommunications equipment market by 1993 is 13.1 percent, up only 2.3 percent from the current share of 10.8 percent, ITC researchers conclude, "[d]omestically produced equipment can't effectively compete with the lower-priced foreign products in certain market segments, notably customer premises equipment [including PBX and key telephone systems]." However, the ITC report does not deal with the extent to which U.S. corporations are manufacturing in foreign markets for the purpose of exporting to the United States.

Glossary

Access Lines — Any circuit from the telephone company's central office to a subscriber's premises. Formerly known as the local loop.

AT&T Information Systems (ATT-IS) — The unregulated subsidiary set up by AT&T to market new telephone equipment after January 1, 1983.

BOCs — Bell Operating Companies. The 22 local operating companies divested from AT&T early in 1984 and reorganized into seven Regional Operating Companies (ROCs). They are allowed to market, but not manufacture, new equipment.

Business Telephone Instruments — All telephones located on business premises, including phone sets associated with Centrex, PBX, and key systems, as well as single-line installations.

Carrier Instruments — Telephone instruments provided by either Bell or the more than 1,400 independent telephone companies.

Centrex — Central office equipment used by local operating companies to provide an alternative to PBX service. There are two generic types of Centrex service:

> **Centrex CO** indicates the operating company has dedicated a portion of its regular central office to an individual customer, providing direct connections to the individual telephones on the customer's premises.
> **Centrex CU** indicates the operating company has built a special central office on the customer's property to provide service.

Electromechanical — Refers to equipment (PBX and key) which incorporates mechanical switches and relays.

Electronic — PBX and key systems (EKTS, EPBX) which have replaced the older mechanical switches and relays with solid-state microprocessor "chips."

Embedded Base — Refers to all Bell-supplied equipment in-place on customers' premises as of January 1, 1983. This equipment was transferred from the Bell Operating Companies to AT&T at the time of divestiture.

Independent — The more than 1,400 independent, non-Bell telephone companies, such as United, Continental, and Centel.

Installed Base — Telephone equipment currently installed and in use.

Instrument — Individual telephone set. Either a single-line installation or connected to a Centrex, PBX, or key system. This study measures instruments roughly in terms of lines actually in use, not in terms of a system's capacity.

Interconnect — The approximately 3,000 non-telephone company suppliers of business telephone instruments.

Key — Multi-line telephone designed to provide pushbutton selection of a specific line from several incoming lines.

Local Area Network (LAN) — A digital data network designed to provide short-haul connection between distributed users.

Migration Strategy — AT&T's pricing plan designed to force existing customers to replace their old Bell equipment with new equipment.

One-A-2 (1A2) — A generic term referring to an early, low-featured electromechanical key system.

Original Equipment Manufacturer (OEM) — A manufacturer which distributes its product, often on an exclusive basis, through marketing companies which provide the equipment under their own name.

PBX — Private Branch Exchange. A private telephone switching system, located on a customer's premises. A PBX is connected to a common group of incoming lines and provides service to a number of individual telephone sets.

Protective Connecting Arrangement (PCA) — A device leased from the telephone company as an interface between customer-provided equipment and the public telephone network. PCAs were required by telephone companies during the period between the Carterfone decision and the establishment of the FCC's Registration Program. The monthly lease charges for PCAs constituted an effective economic barrier to customers' providing their own equipment.

Regional Bell Operating Companies (RBOCs) — The seven holding companies into which the Bell Operating Companies were regrouped at divestiture.

Registration Program — An FCC program which permits the direct connection of terminal equipment, whether customer-provided or telco-provided, to the public telephone network without the need of protective connecting arrangements. The technical standards for direct connection are contained in Part 68 of the FCC's Rules and Regulations.

Resale — Long distance service offered by a company which leases its facilities (circuits) from another carrier.

Retail Market — Refers to telephone equipment, usually single-line but increasingly including small key equipment, sold through traditional retail outlets such as department stores, mail order catalogs, and household electronic shops.

Single-Line Installation — A business telephone instrument providing direct access to the telephone network and not connected to a Centrex, PBX, or key system.

Stand-Alone — A key system directly connected to the telephone network, as opposed to a key system located behind a PBX or Centrex system.

Stored Program Control — Refers to a PBX or key system that is controlled by computer technology and software programs.

System — Refers to an entire PBX, key, or Centrex installation, including all individual telephone instruments, wire, cable, and common equipment (switch for PBX and main distribution frame for key).